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On the occurrence of *Antillesoma antillarum* (Grube, 1858) (Sipuncula, Antillesomatidae) on the south-central part of the Colombian Caribbean coast

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Abstract

We document here the first confirmed report of the sipunculan worm *Antillesoma antillarum* (Grube, 1858) based on freshly collected, taxonomically verified specimens from the south-central Colombian Caribbean coast. This species was encountered on massive coralline rocks, coral rubble, and coral boulder at San Antero. We briefly describe and illustrate this species and provide notes on its distribution, ecology, and habitat.

Keywords

Cryptobiota, geographical distribution, hard substrata, marine environment, sipunculan worm

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Introduction

The sipunculans, commonly known as the peanut worms or star worms (Schulze et al. 2019), are a small group of bilaterally symmetrical, coelomate and non-segmented marine worm (Murina 1984; Cutler 1994) considered close to the annelid group (Staton 2003; Struck et al. 2007; Dordel et al. 2010). The number of recognized species ranges from a systematic compilation of approximately 320 species (Stephen and Edmonds 1972) to a revised number of 150 species (Cutler 1994). The body is formed in two main parts: a larger trunk without segmentation and a retractable introvert, with a tentacular arrangement at the most distal part, either arranged in a circle around the mouth or in a horseshoe shape around the chemosensory nuchal organ. This tentacular crown is more or less developed depending on the taxonomic group (Spongberg 2006; Schulze and Kawauchi 2021). The introvert is often adorned with shields, papillae, and proteinaceous hooks. The remainder of the body wall may be smooth or covered with papillae of various shapes and sizes. Some species, particularly in the genera *Aspidosiphon* Diesing, 1851 and *Cloeosiphon* Grube, 1868, have proteinaceous shields at the anterior and sometimes at the posterior end. *Antillesoma antillarum* (Grube, 1858) have some purple pigment on their tentacles or at the tentacle base (Rice

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1975; Cutler 1994; Adrianov et al. 2006; Adrianov and Maiorova 2012; Schulze and Kawauchi 2021).

Despite their high abundance, sipunculans are often neglected in fauna studies, mainly due to their cryptic habitats and the inability to identify species, which can be challenging for non-experts. Peanut worms have been reported in sand and mud, cracks in or under rocks, burrows in coral or other rocks, and in a variety of abandoned molluscs shells (Schulze 2005; Kedra and Murina 2007; Silvia-Morales et al. 2019). Small sand-filled crevices between the rocks have been reported to be often inhabited by *Themiste* Gray, 1828, *Antillesoma* Stephen & Edmonds, 1972, and some *Golfingia* Lankester, 1885 (Cutler et al. 1984). They are considered ecologically important in the process of dissolving rocks and formation and degeneration of coral reefs, as well as an ecological indicator for environmental monitoring (Glynn 1997; Fonseca et al. 2006; Antonelli et al. 2015). Recent phylogenetic hypotheses have suggested their placement with Annelida based entirely on molecular analyses (Struck et al. 2007; Dordel et al. 2010; Lemer et al. 2015). However, this placement is not supported by analyses based on combined data from extant taxa and fossil (Parry et al. 2016). The fossil record, although sparse, shows a remarkable conservation of the basic sipunculan morphology since the Cambrian (Maxmen et al. 2003; Huang et al. 2004; Muir and Botting 2007).

The first record of *Antillesoma antillarum* reported from Costa Rican waters was collected from Puntarenas and described by Grube (1858). It has been reported in the western Atlantic and the Caribbean from Florida to Brazil. On the coast of Venezuela, it has been recorded from the islands of Cabagua, Los Roques Archipelago National Park, and the Gulf of Cariaco (Cutler and Cutler 1989; Díaz 2011). To our knowledge, little information is available on sipunculans of the Colombian Caribbean. Nevertheless, one publication about this group associated with dead coral skeletons exists; it mentions *A. antillarum* within skeletons of *Pseudodiploria strigosa* (Dana, 1846) and *Orbicella annularis* (Ellis & Solander, 1786) in the Santa Marta region (Gómez et al. 2013). Despite the distribution of *A. antillarum* in the northern Colombian Caribbean, we report here the first confirmed presence of this species in the central and southern Colombian region based on our morphological study of recently collected specimens.

Methods

Sampling localities are within the San Antero region, on the south-central Colombian Caribbean coast (Fig. 1). The region is characterized as tropical with an average annual temperature of 28 °C, relative humidity of 84% and average annual precipitation of 1,337 mm per year (Rangel-Ch and Arellano 2010) and is influenced by the Alisios winds from the northeast and oscillations of the intertropical convergence zone (ITCZ) that regulate the two main climatic seasons that occur in the year (Patiño

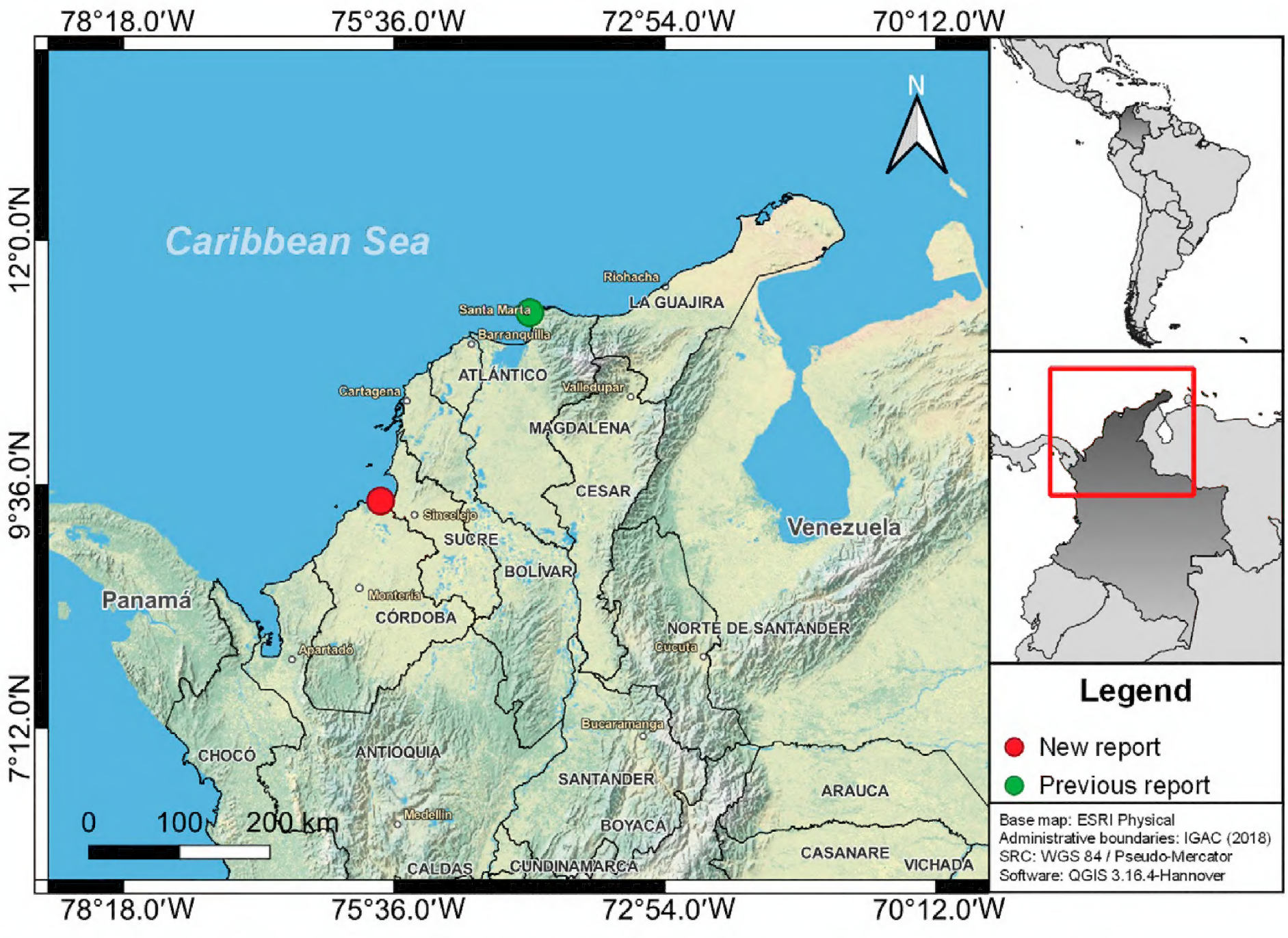

Figure 1. Distribution of *Antillesoma antillarum* from the Colombian Caribbean: green circle = previous report; red circle = new report.

Figure 2. Habitats of *Antillesoma antillarum* in San Antero coast, Córdoba, Colombian Caribbean. **A, B.** Punta Bello habitat, with emphasis on massive coral rocks and macroalgae. **C, D.** Punta Bolívar habitat, with emphasis on coral rubble and coral boulders.

and Flórez 1993). We sampled specimens at Punta Bello and Punta Bolívar from February and March 2019. At Punta Bello there are massive coral rocks and also sponges and macroalgae associated with these rocks. While at Punta Bolívar, coral rubble, coral boulders, and isolated rocks are form the coastline (Fig. 2).

We collected specimens of *A. antillarum* by hand. The specimens were relaxed with menthol and fixed with 10% seawater formalin and later transferred to 70% alcohol for preservation. Length measured from the anterior (introvert) to posterior (end of trunk) and trunk width in mm was taken in the Microscopy Laboratory of the University of Córdoba, with an HD digital camera attached to the Carl Zeiss Axiostar stereomicroscope. Images were assembled using the image stacking software AxioVision Carl Zeiss (Rel.4.8.2. SP3).

Distribution maps were made using QGIS 3.16.4. LTR. Longitude and latitude were obtained from the implementation of primary and secondary information. Localities of specimens were plotted on a global land projection using Environmental Systems Research Institute (ESRI).

Results

The records below are the first of this peanut worm species from Punta Bolívar and Punta Bello, department of Córdoba, and represent the second time that *A. antillarum* has been reported from Colombia.

Phylum Sipuncula Stephen, 1964
Family Antillesomatidae Kawauchi, Sharma & Giribet, 2012
Genus *Antillesoma* Stephen & Edmonds, 1972

***Antillesoma antillarum* (Grube, 1858)**
Figure 3

Newrecords. COLOMBIA – **Córdoba** • San Antero; Punta Bolívar; 09°25′02″N, 075°43′32″W; 1 m alt.; 11.II.2019; Jorge A. Quirós Rodríguez leg.; 2 specimens, CZUC-AN0028 • San Antero; Punta Bello; 09°25′11″N, 075° 44′28″W; 1.5 m alt.; 14.III.2019; Carlos A. Nisperuza Pérez leg.; 7 specimens, CZUC-AN0029.

Identification. The external anatomy and characters of the individuals examined agree with the descriptions provided by Stephen and Edmonds (1972) and Cutler (1994). Voucher material of *A. antillarum* was deposited in the Zoological Collection of the University of Córdoba (CZUC-AN).

This species undoubtedly belongs to the monotypic genus *Antillesoma*, which has a trunk 16–35 mm long and a maximum width of 11 mm (Fig. 3A). There is a large number of digitiform tentacles (>40 in adults) with violet strips and patches (brown in preserved specimens)

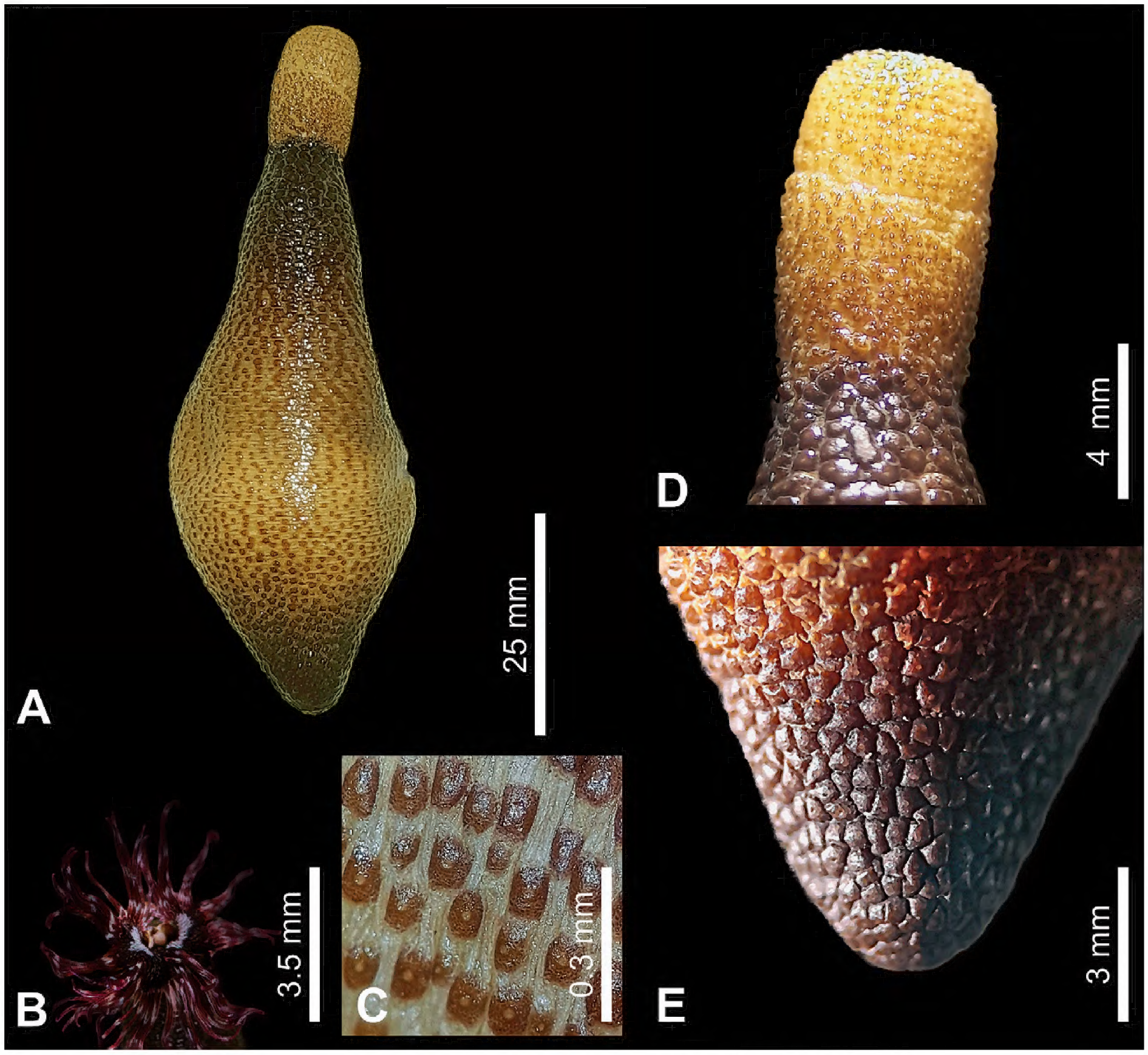

Figure 3. *Antillesoma antillarum* (Grube, 1858) **A.** External view. **B.** Digitiform tentacles (live specimen). **C.** Papillae in the middle part of the trunk. **D.** Papillae from anterior part of the trunk. **E.** Papillae at the trunk end.

surrounding the nuchal organ (Fig. 3B). The introvert is shorter than the trunk and without hooks. The anterior and posterior trunk is dark brown, and the middle region is light-colored and with small papillae (Fig. 3C). The trunk is usually covered with prominent, hemispherical papillae, which are often brown to dark red-brown. Trunk papillae are usually largest at the anterior and posterior ends (Fig. 3D, E).

Habitat. This is a common species found in hard substrata, occurring intertidally (1 m) in rock crevices, massive coralline rocks, coral rubble, and coral boulders. We found this species associated with a variety of habitats: the sponges *Tedania* (*Tedania*) *ignis* (Duchassaing & Michelotti, 1864), *Amphimedon viridis* Duchassaing & Michelotti, and *Neopetrosia carbonaria* (Lamarck, 1814) and the macroalgae *Gracilaria mammillaris* (Montagne) M. Howe, 1918, *G. cervicornis* (Turner) J. Agardh, 1852, and *Alsidium triquetrum* (S.G. Gmelin) Trevisan, 1845).

Previous records in Colombia. *Antillesoma antillarum* was collected from nearby coral reef areas off Santa Marta (Magdalena) (Gómez et al. 2013).

Discussion

Antillesoma antillarum is a common, worldwide species in hard substrata (Hutching 1986; Peyrot-Clausade et al. 1992; Glynn 1997). Despite it being a dominant sipuncular species inhabiting of both live and dead portions of coral skeletons, there are just a few records of the species from around the Colombian Caribbean (Gómez et al. 2013; Quiroz-Ruiz and Londoño-Mesa 2015). In the study area, we found it in hard substrata, occurring in massive coralline rocks, crevices, and coral rubble (Cutler 1994; Glynn 1997; Gómez et al. 2013). Other authors have reviewed the ecological importance of this species in coral reef environments because of this species' capacity to degrade calcium carbonate; thus, it is an important component in bioerosion (Hutchings 1986; Peyrot-Clausade and Brunel 1990; Moreno-Forero et al. 1998; Gómez et al. 2013).

According to several authors, the shallow waters of the northern Colombian Caribbean, and especially embayments, are inhabited by many sipunculid worms associated with dead coral skeletons such as *Aspidosiphon elegans* (Chamiso & Eysenhardt, 1891), *A. fischeri* ten Broeke, 1925, *A. parvulus* Gerould, 1913, *A. steenstrupii* (Diesing, 1859), *Lithacrosiphon cristatus* (Sluiter, 1902), *Phascolosoma nigrescens* (Keferstein, 1865), *P. perlucens* (Baird, 1868), and *A. antillarum*; all of these species belong to cooler-waters elements with input from inland waters and sediments from the Ciénaga Grande de Santa Marta, the Magdalena River and a number of rivers from the Sierra Nevada de Santa Marta (Franco 2005; Árevalo-Martínez and Franco-Herrera 2008). However, *A. antillarum* is also adapted to warm waters along the San Antero coast and from the Sinú River. Further field investigations are likely to reveal the existence of additional sipunculan species in and around the south-central part of the Colombian Caribbean.

The paucity of *A. antillarum* records on the south-central Colombian Caribbean coast may be related to the lack of suitable coral habitats for these worms. It remains to be investigated if this region of coast has a lower availability of this type of habitats compared to other areas of the world, or if this ecological niche is more efficiently occupied by other faunal competitors, such as crustaceans, echinoderms, and mollusks. Furthermore, the type of rock morphology, which influences the establishment of the cryptobiota on hard substrates, could also be a factor related to the low number of specimens found in our study. Massive coralline rocks tend to have a smaller of surface area of dead corals and, thus, support fewer organisms than branched forms (Moreno-Forero et al. 1998; Gómez et al. 2013). Fewer specimens of *A. antillarum* would therefore be expected in the San Antero where the intertidal zone is mostly composed of massive coralline rocks.

Our material of *A. antillarum* is the first from the Córdoba region. The closest previously known occurrence is about 400 km to the northeast in Santa Marta. The taxonomy, ecology, and distribution of sipunculans in the Colombian Caribbean needs additional study, and the findings of this study will lay the foundation for future monitoring that promotes the management and conservation of ecosystems and marine resources.

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